

## SECTION 37

## BITUMINOUS SEALS

Bituminous seals shall conform to Section 37 of the Caltrans Standard Specifications and these City Standard Specifications.

## 37-1 SEAL COATS

**37-1.01 Description.** - Delete paragraph 3 of Subsection 37-1.01.

**37-1.02 Materials.** - Fog seal coat is specified in Subsection 37-3 of this section. If not designated in the special provisions: Aggregates shall be Medium type (1/4" x No. 10 screenings), and asphaltic emulsion for either single coat or double coat applications shall be Rapid-Setting type, grade CRS2 in accordance with Section 94, "Asphaltic Emulsions" of these City Standard Specifications

Aggregate screenings shall be damp at time of application. Salvaged screenings shall not be used in the work.

**37-1.05 Applying Asphaltic Emulsion.** - The fifth, sixth, seventh, and eleventh paragraphs of Section 37-1.05 of the Caltrans Standard Specifications shall not apply.

Asphaltic emulsion shall be applied to only one designated traffic lane at a time and the entire width of the lane shall be covered in one operation.

Under no circumstance shall the length of spread of asphaltic emulsion be greater than can be immediately covered by the screenings, nor shall the operations proceed in such a manner that the binder material will be allowed to chill, set up, dry, or otherwise impair retention of the screenings.

Delete 13th paragraph of Subsection 37-1.05.

## 37-2 SLURRY SEAL

**37-2.01 Slurry Seal.** - This work shall consist of mixing asphalt emulsion, aggregate, set control additives, and water and spreading the mixture on a surfacing or pavement where shown on the plans, as specified in these special provisions, and as directed by the Engineer. The requirements in Subsections 37-2.01 through 37-2.06 of Section 37-2, "Slurry Seal," of the Caltrans Standard Specifications shall not apply.

**37-2.02 Materials.** - The materials for slurry seal immediately prior to mixing shall conform to the following requirements.

**37-2.02A Asphaltic Emulsion.** - Asphaltic emulsion shall be quick-setting Type CQS1h grade conforming to the requirements of these special provisions and Section 94, "Asphaltic Emulsions," of these City Standard Specifications.

**37-2.02B Water and Additives.** - Water shall be of such quality that the asphalt will not separate from the emulsion before the slurry seal is in place in the work. If necessary for workability, a set-control agent that will not adversely affect the slurry seal, may be used.

**37-2.02C Aggregate.** - Aggregate shall consist of rock dust and other sands or other sands of similar nature, except that 100 percent of any aggregate or combination of aggregate, larger than the No. 50 sieve size, used in the mix shall be obtained by crushing rock. The material shall be free from vegetable matter and other deleterious substances. All aggregate shall be free of caked lumps and oversized particles.

The aggregate, prior to the addition of emulsion, shall conform to the requirements of this section. Conformance with the grading requirements will be determined by California Test 202, modified by California Test 105 when there is a difference in specific gravity of 0.2 or more between blends of different aggregates.

- (1) Type II Aggregate - The percentage composition by weight of the aggregate shall conform to the following grading:

<u>Sieve Size</u>	<u>Percentage Passing</u>
3/8	100
No. 4	94-100
No. 8	65-90
No. 16	40-70
No. 30	25-50
No. 200	5-15

The aggregate shall conform to the following additional quality requirements:

<u>Test</u>	<u>California Test</u>	<u>Requirement</u>
Sand Equivalent	217	55 minimum
Durability Index	229	55 minimum

- (2) Type III Aggregate - The percentage composition by weight of the aggregate shall conform to the following grading:

<u>Sieve Size</u>	<u>Percentage Passing</u>
3/8"	100
No. 4	70-90
No. 8	45-70
No. 16	28-50
No. 30	19-34
No. 200	5-15

The aggregate shall conform to the following additional quality requirement:

<u>Test</u>	<u>California Test</u>	<u>Requirement</u>
Sand Equivalent	217	60 minimum
Durability Index	229	55 minimum

If the results of the aggregate grading do not meet gradation specified, the slurry seal represented by such test shall be removed. However, if requested in writing by the Contractor and approved by the Engineer, the slurry seal may remain in place and the Contractor shall pay to the City \$1.75 per ton for such aggregate left in place.

If the result of the Sand Equivalent test for aggregate does not meet the requirement specified, the slurry seal represented by such test shall be removed. However, if requested in writing by the Contractor and approved by the Engineer, the slurry seal may remain in place and the Contractor shall pay to the City \$1.75 per ton for such aggregate left in place.

When the results of both the aggregate grading and the Sand Equivalent test do not conform to the requirements specified, both payments to the City shall apply. The Department may deduct these amounts from any monies due, or that may become due, the Contractor under the contract. No single aggregate grading or sand equivalent test shall represent more than 300 tons or one day's production, whichever is smaller.

**37-2.03 Mix Design.** - At least 7 working days before slurry seal placement commences, the Contractor shall submit to the Engineer for approval a laboratory report of tests and proposed mix design covering the specific materials to be used on the project. The percentage of asphaltic emulsion proposed in the mix design shall be within the percentage range specified in "Proportioning" in this section of the special provisions.

The tests and mix design shall be performed by a laboratory capable of performing the applicable International Slurry Seal Association (ISSA) tests. The proposed slurry seal mixture shall conform to the requirements specified when tested in accordance with the following tests:

<u>Test</u>	<u>Designation</u>	<u>Requirement</u>
Cohesion Test	ASTM D3910	20 Kg -cm within 1 hour (b)
Wet Track Abrasion	ASTM D3910 *	75 grams per square foot maximum

\* California Test 355 may be used for Type II Slurry Seal.

- (a) Mixing test must pass at the maximum expected air temperature at the project site during application.

- (b) Using project source aggregate and asphaltic emulsion and set control agents if used.

The original laboratory report shall be signed by the laboratory that performed the tests and mix design and shall show the results of the test on individual materials, comparing their values to those required by the specifications. The report shall clearly show the proportions of aggregate, filler (minimum and maximum), water (minimum and maximum), asphalt solids content based on the dry weight of aggregate and set-control agent usage. Previous laboratory reports covering the same materials may be accepted provided they are made during the same calendar year.

Once the proportions of materials to be used are approved by the Engineer, no substitution of other material will be permitted unless the materials proposed for substitution are first tested and a laboratory report is submitted for the substituted design as specified above. Substituted materials shall not be used until the mix design for those materials is approved by the Engineer.

**37-2.04 Proportioning.** - Aggregate, asphaltic emulsion, water, and additives, including set-control agent if used, shall be proportioned by volume utilizing the mix design approved by the Engineer. If more than one kind of aggregate is used, the correct amount of each kind of aggregate to produce the required grading shall be proportioned separately, prior to adding the other materials of the mixture, in a manner that will result in a uniform and homogeneous blend.

The completed mixture, after addition of water and any set-control agent used, shall be such that the slurry seal mixture has proper workability and (a) will permit a traffic flow, without pilot-car-assisted traffic control, on the slurry seal within 1 hour after placement without the occurrence of bleeding, raveling, separation or other distress, and (b) will prevent development of bleeding, raveling, separation or other distress within 15 days after placing the slurry seal.

Asphaltic emulsion shall be added at a rate of between 10 to 15 percent by weight of the dry aggregate. The quantity of asphaltic emulsion to be used in the slurry seal mixture will be determined from the design asphalt binder content, as approved by the Engineer, and the asphalt solids content of the asphaltic emulsion furnished.

The Contractor shall furnish an aggregate moisture determination for every two hours of operation or maintain the moisture content to within a maximum daily variation of  $\pm 0.5$  percent.

The aggregate shall be proportioned using a belt feeder operated with an adjustable cutoff gate. The height of the gate opening shall be readily determinable. The emulsion shall be proportioned by a positive displacement pump. Any variable rate emulsion pump, if used, shall be equipped with a means to seal the adjusting unit in its calibrated condition. Water shall be introduced into the mixer by a meter registering in gallons delivered.

Uniformity of distribution of asphalt will be determined by extraction test in accordance with California Test 310. The bitumen ratio (pounds of asphalt per 100 pounds of dry aggregates) shall not vary more than 0.5 pounds of asphalt above or 0.5 pound of asphalt below the amount approved by the Engineer. This requirement shall apply to representative samples taken from any location or operation designated by the Engineer.

The delivery rate of aggregate and emulsion per revolution of the aggregate feeder shall be calibrated at the appropriate gate settings for each mixer-spreader

truck used on the project in accordance with California Test 109 and the requirements of these special provisions.

The aggregate belt feeder shall deliver aggregate to the pugmill with such volumetric consistency that the deviation for any individual aggregate delivery rate check-run shall not exceed 2.0 percent of the mathematical average of three runs of at least 3 tons in duration each. The emulsion pump shall deliver emulsion to the pugmill with such volumetric consistency that the deviation for any individual delivery rate check-run shall be within 2.0 percent of the mathematical average of three runs of at least 500 gallons in each duration.

These check-runs shall be performed for each aggregate source using a vehicle scale that has been error tested in accordance with California Test 109.

The emulsion storage located immediately before the emulsion pump shall be equipped with a device which will automatically shut down the power to the emulsion pump and aggregate belt feeder when the emulsion level is lowered sufficiently to expose the pump suction line.

A temperature-indicating device shall be installed in the emulsion storage tank at the pump suction level. The device shall indicate temperature of the emulsion and shall be accurate to  $\pm 5^{\circ}$  F.

The belt delivering the aggregate to the pugmill shall be equipped with a device to monitor the depth of aggregate being delivered to the pugmill. Said device for monitoring depth of aggregate shall automatically shut down the power to the aggregate belt feeder whenever the depth of aggregate is less than 70 percent of the target depth flow. A second device shall be located where it will monitor movement of the aggregate belt by detecting revolutions of the belt feeder. The device for monitoring no flow or belt movement, as the case may be, shall automatically shut down the power to the aggregate belt when aggregate belt movement is interrupted. This second device will not be required where the aggregate delivery belt is an integral part of its drive chain.

To avoid erroneous shutdown by normal fluctuation, a delay of 3 seconds between sensing less than desirable storage levels of aggregate or emulsion and shutdown of the proportioning operation will be permitted.

**37-2.05 Mixing and Spreading Equipment.** - The slurry seal shall be mixed in continuous pugmill mixers of adequate size and power for the type of slurry seal to be placed. All indicators required in the section entitled "Proportioning" shall be in working order prior to commencing mixing and spreading operations.

Mixers-spreader trucks shall be equipped to proportion emulsion, water, aggregate, and set-control additives by volume. All rotating and reciprocating equipment on mixer-spreader trucks shall be covered with metal guards.

The mixer-spreader truck shall not be operated unless all low-flow and no-flow devices and revolution counters are in good working condition and functioning and all metal guards are in place. All indicators required by these special provisions shall be visible while walking alongside the mixer-spreader truck.

Aggregate feeders shall be connected directly to the drive on the emulsion pump. The drive shaft of the aggregate feeder shall be equipped with a revolution counter reading to the nearest full revolution of the aggregate delivery belt.

At least two operational spreader trucks shall be available at the jobsite during the spreading operation except when continuous placement type mixer-spreader trucks are used.

In addition to the requirements of the fourth paragraph of Section 5-1.10, "Equipment and Plants", the identifying number of mixer-spreader trucks shall be at least 2 inches in height, located on the front and rear of the vehicle.

The slurry mixture shall be spread by means of a controlled spreader box conforming to the following requirements:

The spreader shall be capable of spreading a traffic lane width and shall have strips of flexible rubber belting or similar material on each side of the spreader box and in contact with the pavement to positively prevent loss of slurry from the ends of the box. All spreader boxes over 7-1/2 feet in width shall have baffles, reversible motor driven augers, or other suitable means, to insure uniform application on superelevated sections and shoulder slopes. Spreader box skids shall be maintained in such manner as to prevent chatter (wash boarding) in the finished mat.

Rear flexible strike-off blades shall make close contact with the pavement, and shall be capable of being adjusted to the various crown shapes so as to apply a uniform slurry seal coat.

Flexible drags, to be attached to the rear of the spreader box, shall be provided as directed by the Engineer. All drags and strike-off blades (rubbers) shall be cleaned or changed daily if problems with cleanliness and longitudinal scouring occur.

The spreader box shall be clean, free of all slurry seal and emulsion, at the start of each work shift.

Slurry mixture, to be spread in areas inaccessible to the controlled spreader box, may be spread by other approved methods.

**37-2.06 Placing** - The slurry mixture shall be uniformly spread on the existing surfacing within the rate specified without spotting, rehandling or otherwise shifting of the mixture.

Slurry seal shall not be placed when the existing pavement temperature is below 50° F. or during unsuitable weather.

Before placing the slurry seal, the pavement surface shall be cleaned by sweeping, flushing or other means necessary to remove all loose particles of paving, all dirt and all other extraneous material.

Slurry seal mixture shall be spread at a rate within 20 to 25 pounds of dry aggregate per square yard. The exact rate will be as determined by the Engineer. The completed spread shall be within 10 percent of the rate determined by the Engineer.

Longitudinal joints shall correspond with the edges of traffic lanes. The Engineer may permit other patterns of longitudinal joints, if such patterns will not adversely affect the quality of the finished product, as determined by the Engineer.

All through driving lanes shall be spread in full lane width pulls only. Longitudinal joints, common to two driving lanes, shall be butt joints with overlaps not to exceed 3 inches. Building paper shall be placed at transverse joints, over previously placed slurry seal, or other suitable methods used to avoid double placement of slurry seal. Hand tools shall be available in order to remove spillage. Ridges or bumps in the finished surface will not be permitted.

The mixture shall be uniform and homogenous after spreading on the surfacing and shall not show separation of the emulsion and aggregate after setting.

Adequate means shall be provided to protect the slurry seal from damage by traffic until such time that the mixture has cured sufficiently so that the slurry seal will not adhere to and be picked up by the tires of vehicles.

### 37-3 FOG SEAL COAT

**37-3.01 Description.** - This work shall consist of furnishing and applying emulsified asphalt or cationic maltenes emulsion as a fog seal coat as shown on the plans, as specified in these specifications and as directed by the Engineer.

**37-3.02 Materials.** - Fog seal coat shall be grade SS1 asphaltic emulsion or cationic maltenes emulsion, as specified in the special provisions or on the plans, in accordance with Section 94, "Asphaltic Emulsions" of these standard specifications.

**37-3.03 Maintaining Traffic.** - At locations where public traffic is being routed over a surface upon which a fog seal is to be applied, the fog seal shall not be applied to more than one-half the width of the traveled way at a time, and the remaining width shall be kept free of obstructions and open for use by public traffic until the fog seal first applied is ready for use by traffic.

The contractor shall provide for the passage of public traffic in accordance with the provisions in Section 7-1.08, "Public Convenience," and 7-1.09, "Public Safety" and when directed by the Engineer, traffic shall be routed through the work under one-way control.

**37-3.04 Preparation of Surface.** - Immediately before applying the fog seal, the surface to be sealed shall be cleaned of all loose and extraneous material.

**37-3.05 Application.** - Fog seal shall not be applied when weather conditions are unsuitable or when the surface temperature is below 50° F.

Fog seal coat shall be applied in accordance with the provisions of Section 94, "Asphaltic Emulsions," and the provisions of this section.

Grade SS-1 asphalt emulsion shall be diluted with an equal amount of water and sprayed at the rate of 0.05 to 0.2 gallon (of diluted material) per square yard. The exact rate of application will be determined by the Engineer.

Cationic maltenes emulsion shall be diluted with water at the approximate rate of 33 percent of water, by volume of the combined mixture. The diluted mixture of cationic maltenes emulsion shall be spread at the rate of 0.04 to 0.10 gallon per square yard. The exact rate of application will be determined by the Engineer.

Fog seal material shall be applied by means of a pressure distributor in a uniform, continuous spread over the section to be treated and within the temperature range specified for the type of material.

If the cut off of the distributor is not positive, a strip of building paper, at least 3 feet in width and with a length equal to that of the spray bar plus one foot, shall be used at the beginning and end of each spread.

When more than one type of seal coat is to be applied, the fog seal coat shall be applied at least four days in advance of the application of an adjoining seal coat requiring screenings. The seal coats shall be applied in such a manner that the joint between the two types will present a neat and uniform appearance true to the line shown on the typical cross section and as established by the Engineer.

After the application of a fog seal coat, any asphaltic emulsion that becomes tacky shall be sprinkled with water in the amount ordered and as directed by the Engineer, and any cationic maltenes emulsion that fails to penetrate or causes the surface treated to become slippery, shall be blotted with sand in the amount ordered and as directed by the Engineer.

Fog seal shall not be applied to open graded paving courses.

**37-3.06 Measurement.** - Quantities of seal coat to be paid for will be measured by the ton in accordance with the provisions in Section 94, "Asphaltic Emulsions."

**37-3.07 Payment.** - The quantities of fog seal will be paid for at the contract unit price per ton unless included in the price of asphalt concrete. The price shall include preparation for treatment, furnishing, mixing and applying the fog seal.

The above price and payment shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying fog seal coat, complete in place, as shown on the plans, and as specified in these specifications and as directed by the Engineer.

Water furnished and applied to tacky emulsion and for mixing with asphaltic emulsion fog seal will not be paid for and full compensation therefor will be considered as included in the contract price paid for the asphaltic emulsion fog seal.

Water furnished for mixing with cationic maltenes emulsion fog seal or sand required for blotter material will not be paid for and full compensation therefor will be considered as included in the contract price paid for the cationic maltenes emulsion fog seal.

No adjustment of compensation will be made for any increase or decrease in the quantity of fog seal material required, regardless of the reason for such. The provisions in Section 4-1.03B, "Increased or Decreased Quantities," shall not apply to the item of fog seal coat.